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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Recyclable Carpet and Method of Manufacture

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ABSTRACT OF THE INVENTION

This invention relates to a recyclable carpet comprising a primary backing, pile and binder that are all made from materials that are all of substantially the same generic class. The invention also includes a method of  
5 making carpet and particularly making the recyclable carpet of the invention. The method includes softening the materials from which the primary backing, pile and binder are made, and allowing the various components of the carpet to adhere to each other. The invention is useful in that it  
10 provides a recyclable carpet and a method of making carpet and particularly for making recyclable carpet.

BACKGROUND OF THE INVENTION

This invention relates to recyclable carpet and a method of making recyclable carpet.

In the past, carpet has not been recyclable in the sense that trimmed pieces of carpet, or used or wasted carpet, could not be melted together and the resulting material used to form new carpet. In the past, carpet has been made with typically three or four main components. These were the pile, the primary backing, the binder and in some cases a secondary backing. These components each served a separate and distinct purpose or function. Therefore, materials for these components were chosen to best provide the characteristics for fulfilling that particular function or purpose. Because the functions and purposes of the various components are different, the materials of the various components have always been different, such as nylon for one function and polypropylene for a second and jute for a third. In some situations, two of the components were sometimes made from the same material. However, all of the three or four components were never made from the same material.

Because the various materials had different characteristics in order to better provide the desired

results, the various materials could not be softened together to form a suitable single material that could be suitably used to make new carpet, or suitably used for some other purpose. Therefore, scrap cuttings from past carpet,  
5 and even used carpet, could not be satisfactorily recycled.

Also, the binders that were used in past carpets, often included components, such as glues or solvents, that may possibly be considered hazardous or harmful to the health of some people. Also, many binders included  
10 materials or were made from materials that are not recyclable, such as latex.

Also, some people are sensitive to some materials that were used in past carpet. One such material was jute.

#### SUMMARY OF THE INVENTION

15 Accordingly, it is an object of this invention to at least partially overcome the disadvantages of the past carpets. Also, it is an object of this invention to provide an alternative type of carpet that is recyclable in the sense that the carpet, or pieces of the carpet, can be  
20 melted and the resulting material can be reused to make other carpet or be used for other purposes.

Accordingly, in one of its broad aspects, this invention resides in providing recyclable carpet comprising primary backing having first and second surfaces, and  
25 wherein the backing is made from a first material having a softening point within a range from about 118 °C to about

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270 °C and having an ability to adhere to itself and materials of substantially the same generic class when softened and cooled; pile extending from at least the first surface of the primary backing and made from a material that  
5 is of substantially the same generic class as the first material; and binder adhering to at least the second surface of the primary backing and made from a material that is of substantially the same generic class as the first material.

10 Further aspects of the invention reside in providing a method of manufacturing recyclable carpet, comprising connecting to a primary backing having first and second surfaces, and wherein the backing is made from a first material having a softening point within a range from  
15 about 118 °C to about 270 °C and having an ability to adhere to itself and materials of substantially the same generic class when softened and cooled, a pile extending from at least the first surface of the primary backing and wherein the pile is made from a material that is of substantially  
20 the same generic class as the first material; bringing suitably softened binder made from a material that is of substantially the same generic class as the first material into contact with at least the second surface of the primary backing; softening a surface portion of the primary  
25 backing; and cooling the binder and the primary backing so as to allow the binder to adhere to the primary backing.

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Further aspects of the invention will become apparent upon reading the following detailed description and the drawings which illustrate the invention and preferred embodiments of the invention.

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BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1 is a schematic cross-sectional drawing of a carpet of the invention.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS  
OF THE INVENTION

As shown in Figure 1, recyclable carpet 10 according to the invention includes primary backing 12, pile 14 and a binder 16.

15 The primary backing 12 may be in a form that is commonly used, in that the primary backing 12 may be woven or non-woven, and it may be a film or a sheet. Preferably, the primary backing 12 is made from a material that is a polyolefin, a polyamide or a polyester. However, the important characteristics of the the primary backing 12 are  
20 that it <sup>could</sup> be made from a material that has a softening point within the range of about 118 °C to about 270 °C degrees, and that the material has the ability to adhere to itself, and other materials of the same generic class, when softened and cooled. The phrase "substantially the same generic

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class" is intended to mean and include those materials that have substantially the same characteristics so as to permit the two materials to be softened together and then, when cooled, to form one material.

5           When the material is softened, in addition to being softened by heat, it is intended that "softened" may also mean and includes being treated chemically or otherwise so as to put the material into a condition which allows the material to adhere to itself or other materials of the same  
10 generic class.

          Suitable materials will most likely be synthetic materials. Preferably, the primary backing 12 is made from polyethylene or butylene, and most preferably from polypropylene. Also, the primary backing 12 could be made  
15 from a nylon (a polyamide) such as nylon 6, nylon 6,6 or nylon 12,12. Also, the primary backing 12 could be made from a polyester.

          A more detailed description of the type of material that is a suitable material and the reasons for  
20 selecting that type of material is given later in this disclosure after a fuller description of the overall carpet 10 is given.

          The primary backing 12 has a first surface 12a and a second surface 12b. Extending from at least the first  
25 surface 12a of the primary backing 12 is pile 14. The pile 14 may also extend to a lesser extent from the second

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surface 12b of the primary backing 12. The pile 14 may be in a form that is common such as in filament form or in spun form.

5           The pile 14 is made from a material that is of substantially the same generic class as the material from which the primary backing 12 is made. It is expected that the primary backing 12 will be made from a material that includes some additives that give the material characteristics that make the material better suited for its particular purpose. However, it is contemplated that the amounts and quantities of those additives would not substantially affect the abilities of the materials to be softened and then formed together into one acceptable material.

15           Many of the additives that are added to the materials are trade secrets of the particular material manufacturer. For example, the manufacturer of the primary backing 12 may add certain ingredients to give colour, abrasion resistance, UV light stability or flammability. 20 Similarly, the manufacturer of the primary backing 12 would also add certain secret ingredients to give the primary backing 12 preferred characteristics. Thus, it is not possible to list all of the possible ingredients that could be added to the various materials and not substantially 25 affect the characteristics of the materials for the purpose of this invention. In any case, it is intended that a



material that includes additives is included within the meaning of a material of substantially the same generic class if those materials have substantially the same characteristics so as to permit the two materials to be  
5 softened and then, when cooled, to form one material.

The binder 16 adheres to at least the second surface 12b of the primary backing 12. The binder 16 may also adhere to the first surface 12a of the primary backing 12 and/or the pile 14.

10 The binder 16 is made from a material that is of substantially the same generic class as the material from which the primary backing 12 is made. However, once again, it is contemplated that the material from which the binder 16 is made will include certain additives that are kept  
15 secret by the manufacturers of binders. Provided that the material allows the binder 16 to perform in accordance with the requirements of the invention, it will be an acceptable material.

The requirements of the invention are that the  
20 material of the pile 14 will adhere to the material of the primary backing 12 when the two are softened and cooled; and that the material of the binder 16 will adhere to the material of the primary backing 12 when the two are softened and cooled.

25 Preferrably, the material of the primary backing 12 is a polyolefin, particularly polyethylene or butylene,

and most preferably polypropylene.

Preferably, if the primary backing 12 is made from polypropylene, the pile 14 and the binder 16 are made from polypropylene also. As discussed above, even though all  
5 three of the primary backing 12, pile 14 and binder 16 are made from polypropylene, there may be, and most likely will be, different additives in each of the parts. However, provided the materials of each of the primary backing 12, pile 14 and binder 16 is of substantially the same generic  
10 class as the material of the others so as to allow the materials to adhere when softened and cooled to the respective component, the carpet 10 will fall within the scope of the invention.

The binder 16 may also be made from a polyamide or  
15 a polyester. Preferably, when the primary backing 12 is made from a polyolefin, the pile 14 and the binder 16 are also made from a polyolefin. Similarly, when the primary backing 12 is made from a polyamide, the pile 14 and the binder 16 are made from polyamides. Similarly, when the  
20 primary backing 12 is made from a polyester, the pile 14 and the binder 16 are made from polyesters.

Another aspect of the invention is a method of manufacturing carpet, particularly recyclable carpet, such as the carpet 10 as described above.

25 The method includes connecting to a primary backing, preferably a primary backing 12 as described above,

a pile, preferably a pile 14 as described above. The pile 14 extends from at least the first surface 12a of the primary backing 12 and is made from a material that is of substantially the same generic class as the material of the primary backing 12. The pile 14 may be connected to the primary backing 12 in known manners such as by tufting, needling or fusing, or otherwise.

The next step in the method is to bring suitably softened binder into contact with at least the second surface 12b of the primary backing 12. Preferably, the binder is made from a material that is of substantially the same generic class as the material of the primary backing 12. Preferably, the binder is a binder 16 as described above.

Because the binder 16 is softened, it will cause a softening of the material with which it comes in contact. For example, if the softened binder 16 comes in contact with the primary backing 12, the primary backing 12 will become softened, either through the direct transfer of heat or through the transfer of softening chemical. The amount of softening of the material which comes into contact with the already softened material depends on many factors. For example, if the binder 16 comes in contact with the primary backing 12, the extent of softening of the primary backing 12 will depend on the temperature of the binder 16 or the amount and type of softening chemical applied to the

binder 16, and the amount of time the binder 16 remains in its softened state. Thus, the cooling rate of the binder 16 will also be a factor. The suitable selection of the parameters of the various factors is well within the scope of persons skilled in the art, particularly with some experimentation with the various combinations of materials and the various factors.

Thus, when the suitably softened binder 16 is brought into contact with the primary backing 12, a portion of the surface of the primary backing 12 will become softened. The depth or penetration or extent of the softening of the second material will depend on the appropriate factors as generally discussed above. The critical feature of the selection of materials and factors is that the primary backing 12 cannot be softened to such an extent that it completely melts or loses its ability to function as either a primary backing, pile or binder as appropriate. On the other hand, the primary backing 12, or other appropriate material, must be softened sufficiently so as to allow the binder 16 to adhere to the primary backing 12 when the binder 16 and the primary backing 12 are cooled. Thus, throughout this disclosure and throughout the claims, when the phrases "suitably softened" or "softened" are used, it is intended that the phrase refers to and includes all materials that are softened, either directly by heat or chemically, which will not result in the various

materials melting or losing their ability to function properly and at the same time will allow the material to adhere to another.

In a preferred embodiment of the invention, there  
5 is an additional step in the method of making the carpet  
10. The additional step involves suitably softening and  
cooling the pile 14 and thereby adhering the pile 14 to the  
primary backing 12 or binder 16, or both. Preferably, the  
pile 14 is softened by bringing the pile 14 into contact  
10 with the softened binder 16 or the softened primary backing.  
12. Thus, preferably, the pile 14 would be softened at  
approximately the same time as the suitably softened binder  
16 makes contact with the primary backing 12. In this  
embodiment, some of the suitably softened binder 16 will  
15 come into contact with the pile 14 and soften the pile 14.  
When the pile 14 is cooled, it will be adhered to either the  
binder 16 or primary backing 12, or both.

In a further embodiment of the invention, a  
primary backing, preferably a primary backing 12 as  
20 described above, is provided in a suitably softened state.  
Pile, preferably pile 14 as described above and made from a  
material that is of substantially the same generic class, is  
brought into contact with the suitably softened primary  
backing 12. Thus, a surface portion of the pile 14 is  
25 softened. The pile 14 and the primary backing 12 are then  
cooled so as to allow the pile 14 to adhere to the primary

backing 12.

Also, suitably softened binder, preferably binder 16 as described above and made from a material that is of substantially the same generic class, is brought into  
5 contact with at least the second surface 12b of the the primary backing 12. The binder 16 and the primary backing 12 are then cooled so as to allow the binder 16 and the primary backing 12 to adhere to each other.

Preferably, there is an additional step to the  
10 method whereby the binder 16 softens a surface portion of the pile 14, and the binder 16 and the pile 14 are cooled so as to allow the binder 16 to adhere to the pile 14.

Preferably, the step of bringing the pile 14 into contact with the softened primary backing 12 takes place at  
15 about the same time as the step of bringing the softened binder 16 into contact with the primary backing 12.

Another aspect of the invention resides in providing a method of manufacturing carpet, particularly recyclable carpet, comprising attaching the binder,  
20 preferably a binder 16 as described above, to at least the second surface 12b of a primary backing, preferably a primary backing 12 as described above, and then attaching pile, preferably a pile 14 as described above, to at least the first surface of the primary backing 12.

25 Preferably, in this method, the primary backing 12 and the binder 16 are softened, cooled and adhered together

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in a manner similiar to those disclosed above. However, the primary backing 12 and the binder 16 may be attached by other suitable means.

5 After the primary backing 12 has been adhered to the binder 16, this primary backing/binder combination can be transported to another area of the same mill or to another mill to have the pile 14 attached. It is also possible to have the pile 14 attached simulataneously or almost simultaneously with the step of adhering the  
10 binder 16 to the primary backing 12.

If the primary backing/binder combination is cooled before the pile 14 is be attached, the pile 14 may be attached by methods such as needling, tufting, fusing or otherwise. Preferably, the pile 14 is attached to at least  
15 the first surface of the primary backing 12 by softening, cooling and adhering the pile 14 to the primary backing 12. In this situation, it may be necessary to resoften at least the first surface 12a of the primary backing 12.

20 The above teachings respecting other methods of manufacturing carpet, particularly recyclable carpet 10, are also applicable to this aspect of the invention.

It will be understood that, although various features of the invention have been described with respect  
25 to one or another of the embodiments of the invention, the various features and embodiments of the invention may be

combined or used in conjunction with other features and  
embodiments of the invention as described and illustrated  
herein.

Although this disclosure has described and  
5 illustrated certain preferred embodiments of the invention,  
it is to be understood that the invention is not restricted  
to these particular embodiments. Rather, the invention  
includes all embodiments which are functional, chemical or  
mechanical equivalents of the specific embodiments and  
10 features that have been described and illustrated herein.



The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Recyclable carpet comprising:

- (a) primary backing having first and second surfaces, and wherein the backing is made from a first material having a softening point within a range from about 118 °C to about 270 °C and having an ability to adhere to itself and materials of substantially the same generic class when softened and cooled;
- (b) pile extending from at least the first surface of the primary backing and made from a material that is of substantially the same generic class as the first material; and
- (c) binder adhering to at least the second surface of the primary backing and made from a material that is of substantially the same generic class as the first material.

2. A recyclable carpet as defined in claim 1 wherein the first material is a polyolefin.

3. A recyclable carpet as defined in claim 2 wherein the first material is polypropylene.

4. A recyclable carpet as defined in claim 2 wherein the first material is polyethylene.
5. A recyclable carpet as defined in claim 2 wherein the first material is polybutylene.
6. A recyclable carpet as defined in claim 3 wherein the pile and the binder are each polypropylene.
7. A recyclable carpet as defined in claim 4 wherein the pile and the binder are each polyethylene.
8. A recyclable carpet as defined in claim 1 wherein the first material is a polyamide.
9. A recyclable carpet as defined in claim 1 wherein the first material is a polyester.
10. A recyclable carpet as defined in claim 1 wherein the pile is adhered to at least one of the pile and binder.
11. A recyclable carpet as defined in claim 6 wherein the pile is adhered to at least one of the pile and binder.
12. A method of manufacturing recyclable carpet,

comprising:

- (a) connecting to a primary backing having first and second surfaces, and wherein the backing is made from a first material having a softening point within a range from about 118 °C to about 270 °C and having an ability to adhere to itself and materials of substantially the same generic class when softened and cooled, a pile extending from at least the first surface of the primary backing and wherein the pile is made from a material that is of substantially the same generic class as the first material;
  - (b) bringing suitably softened binder made from a material that is of substantially the same generic class as the first material into contact with at least the second surface of the primary backing;
  - (c) softening a surface portion of the primary backing; and
  - (d) cooling the binder and the primary backing so as to allow the binder to adhere to the primary backing.
13. A method of manufacturing recyclable carpet as defined in claim 12 wherein the pile is softened, cooled and adhered to the primary backing.
14. A method of manufacturing recyclable carpet as defined

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in claim 13 wherein the pile is softened, cooled and adhered to the binder.

15. A method of manufacturing recyclable carpet as defined in any of claims 13, 14 or 15 wherein the materials of the primary backing, pile and binder are all polypropylene.
16. A method of manufacturing recyclable carpet, comprising:
  - (a) providing, in a suitably softened state, a primary backing having a first surface and a second surface, and wherein the primary backing is made from a first material having a softening point within a range from about 118 °C to about 270 °C and having an ability to adhere to itself and materials of substantially the same generic class when softened and cooled;
  - (b) bringing pile made from a material that is of substantially the same generic class as the first material into contact with the softened primary backing;
  - (c) softening a surface portion of the pile;
  - (d) cooling the primary backing and the pile so as to allow the pile to adhere to the primary backing;
  - (e) bringing suitably softened binder made from a

material that is of substantially the same generic class as the first material into contact with at least the second surface of the suitably softened primary backing; and

(f) cooling the binder and the primary backing so as to allow the binder to adhere to the primary backing.

17. A method of manufacturing recyclable carpet as defined in claim 16 wherein the binder softens a surface portion of the pile, and the pile and binder are cooled so as to allow the pile to adhere to the binder.

18. A method of manufacturing recyclable carpet as defined in any of claims 16 or 17 wherein the materials of the primary backing, pile and binder are all polypropylene.

19. A method of manufacturing carpet comprising:

(a) attaching a binder to at least a second surface of a primary backing having a first surface and a second surface; and

(b) attaching pile to at least the first surface of the primary backing.

20. A method of manufacturing carpet as defined in claim 19 wherein the carpet is a recyclable carpet and wherein the primary backing is made from a first material

having a softening point within a range from about 118 °C to about 270 °C and having an ability to adhere to itself and materials of substantially the same generic class when softened and cooled; and the pile and the binder is each made from a material that is of substantially the same generic class as the first material.

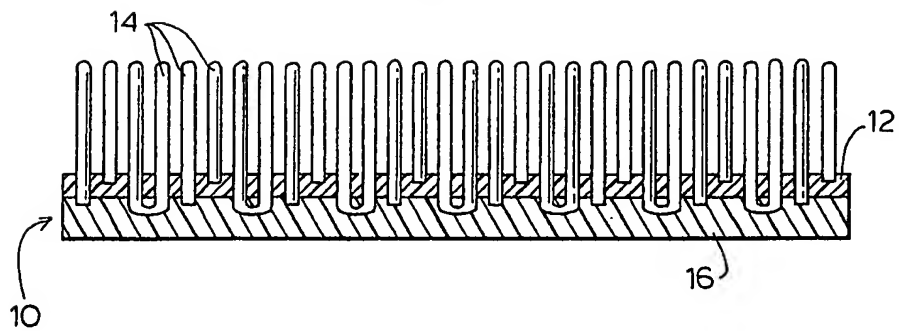
21. A method of manufacturing carpet as defined in claim 20 wherein the primary backing and the binder are softened, cooled and adhered together.
22. A method of manufacturing carpet as defined in claim 21 wherein the pile is softened, cooled and adhered to at least the first surface of the primary backing.
23. A method of manufacturing carpet as defined in claim 22 wherein at least the first surface of the primary backing is resoftened and cooled and adhered to the pile.
24. A method of manufacturing recyclable carpet as defined in any of claims 20 or 21 wherein the materials of the primary backing, pile and binder are all polypropylene.
25. A method of manufacturing recyclable carpet as defined

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in any of claims 22 or 23 wherein the materials of the  
primary backing, pile and binder are all polypropylene.

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FIG. 1



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